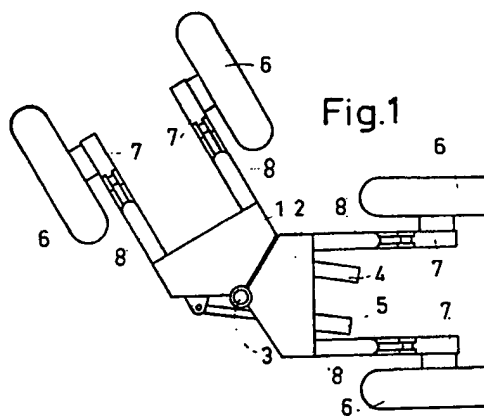


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(54) Cross-country vehicles

(57) A cross-country vehicle has a chassis consisting of two sections 1, 2 which are swivellable about a vertical axis 3 relative to each other. The ground wheels of the vehicle are located at the free ends of pivotal arms 7 connected to the chassis so that they can be rotated in vertical planes under the actuation of pressure cylinders 8 to change the position in height of the wheels. Two pivotal arms are provided for the wheels associated with each section of the chassis and all the pivotal arms are independently rotatable about their pivotal axes.



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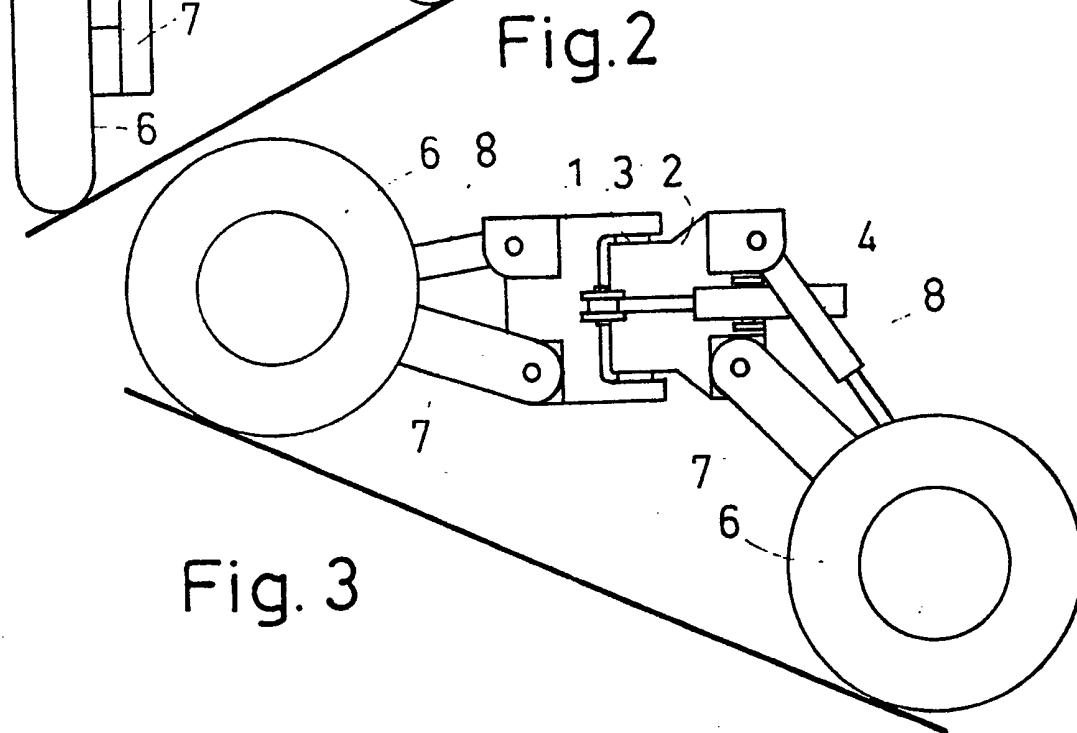
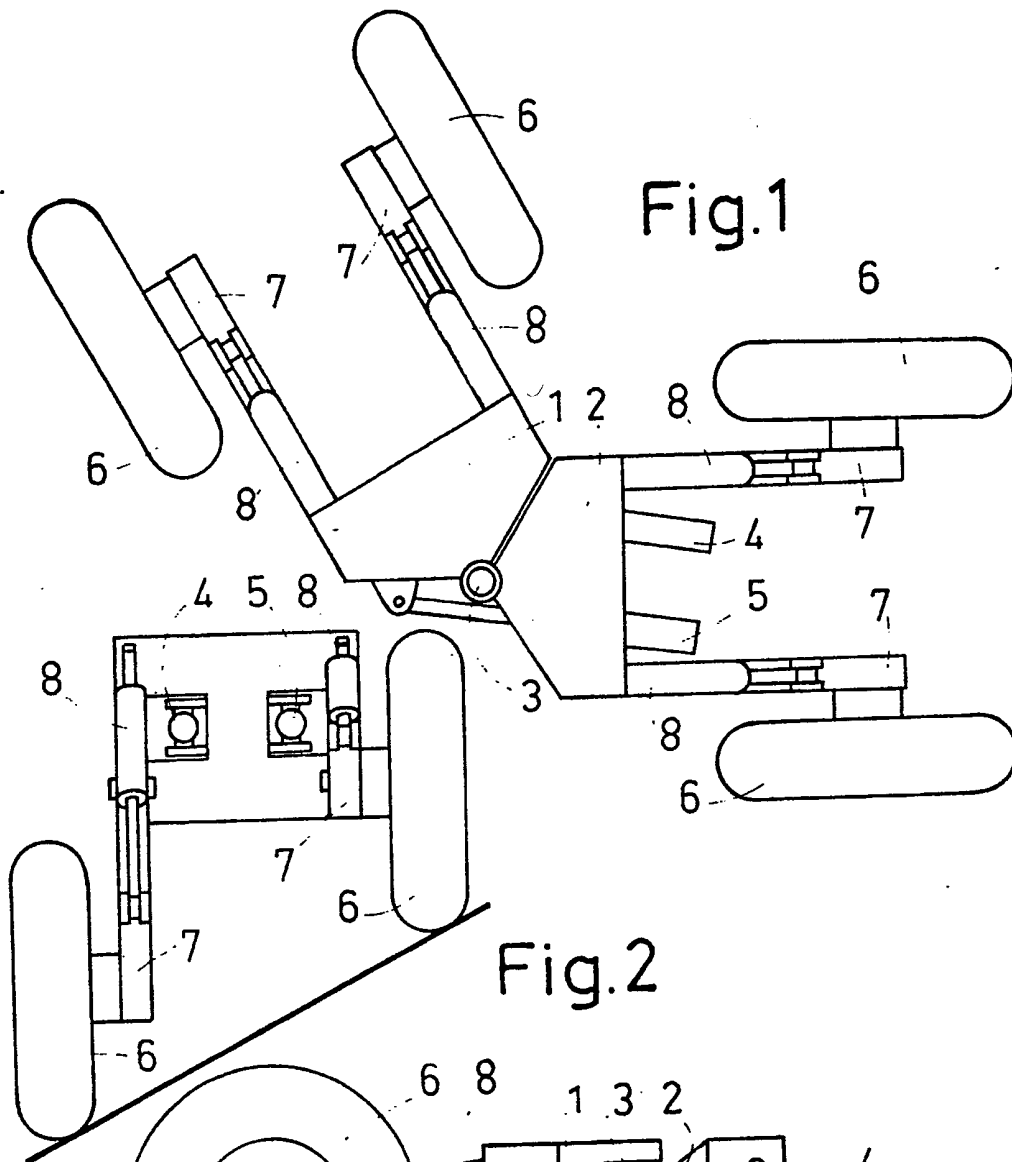


Fig. 3

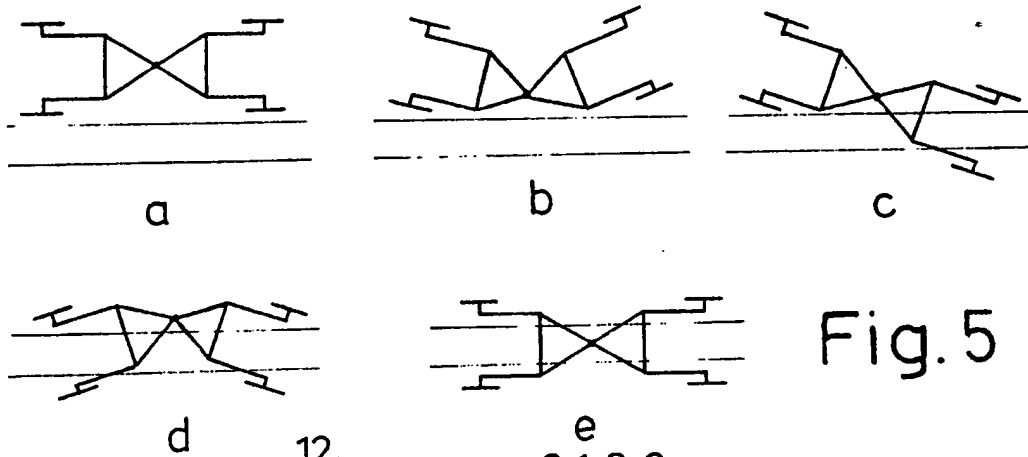
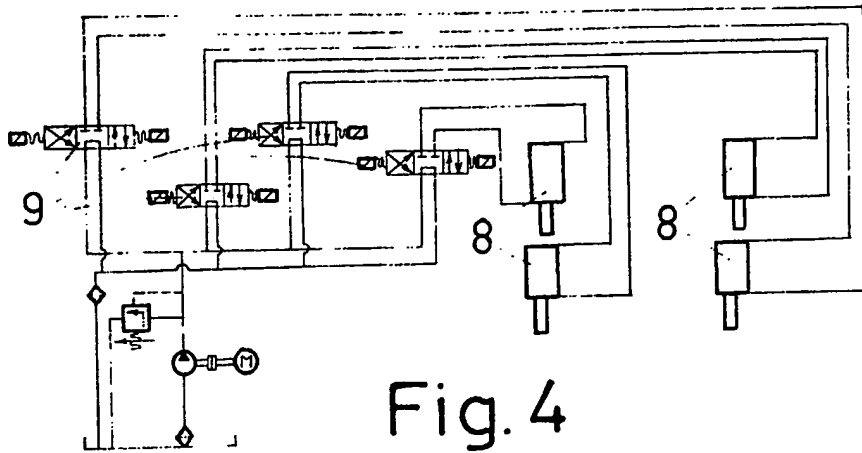
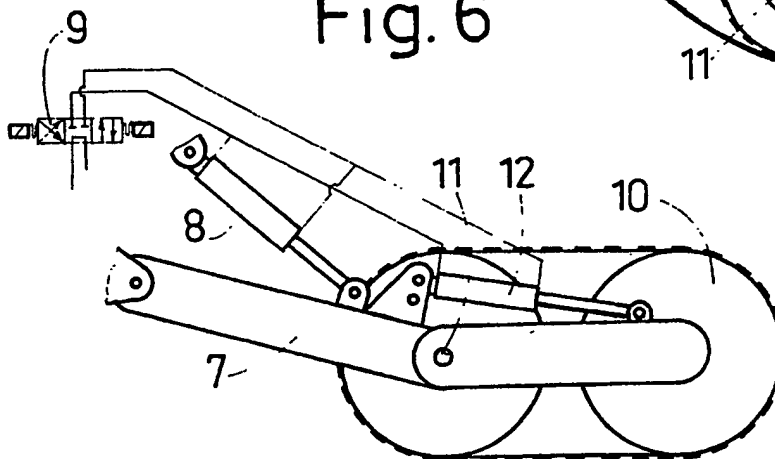
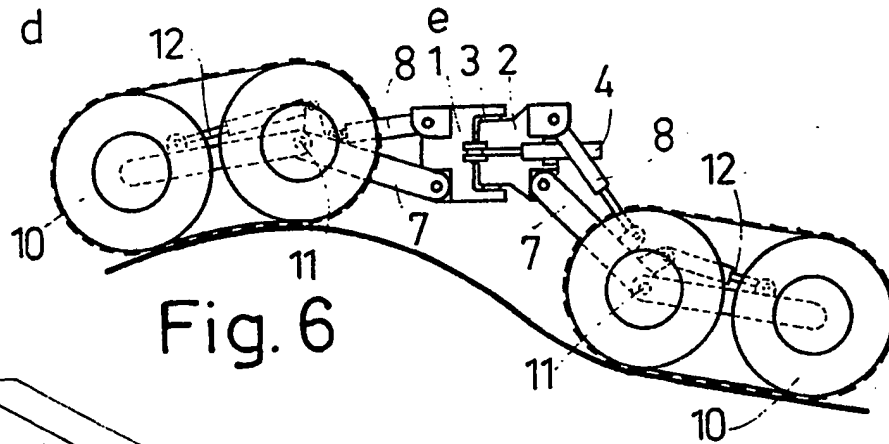


Fig. 5



## SPECIFICATION

## Cross-country vehicle

5 The present invention concerns a cross-country vehicle whose chassis consists of two sections which are swivellable about a vertical axis relatively to each other, and whose ground wheels are located at the free ends of pivotal arms connected to the chassis, these arms being rotatable about their

10 pivotal axes in vertical planes under the actuation of pressure cylinders so that the position in height of the wheels can be changed.

The drawback observed in prior art vehicles of this kind is that when travelling uphill or downhill the weight of the vehicle is unequally distributed between the front and rear wheels. Since the chassis of the vehicle cannot in every situation be brought into the horizontal, the operation of loaders and working implements attached thereto is greatly impeded. Moreover, the stability of the such vehicles against overturning is not very good because of their three-point support. The construction has necessarily implied a rocking front axle or a pivot in the

25 chassis of the vehicle.

The object of the present invention is to provide a novel form of cross-country vehicles which does not suffer from the above mentioned drawback. The cross-country vehicle of the invention is characterized in that each section of the chassis has two said pivotal arms, all said pivotal arms being independently rotatable about their pivotal axes.

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Hence, it is possible to drive a vehicle according to the invention even on steep hillsides and in all directions with the vehicle chassis remaining horizontal. The weight of the vehicle is uniformly distributed between all wheels, whereby the risk of overturning is also minimised. The conditions for operation of any accessories attached to the vehicle are good. The vehicle is supported by four wheels. The wheels of the vehicle can be maintained vertical, with the result that no significant axial forces will act on the wheels. The vehicle may surmount even difficult obstacles on either side because one wheel at a time can be raised aloft when meeting the obstacle. Requisite balance of the vehicle is even attained on three wheels and driving can be continued on three wheels until the obstacle has been passed, whereupon the wheel which has been raised

45 is lowered again. In this way, for instance, the vehicle may be driven in over a ditch in such manner that the wheels are positioned to straddle the ditch.

A soft ground patch located on one side of the vehicle and having a length not in excess of the vehicle length may also be crossed. The ground clearance of the vehicle can be made adjustable between wide limits, whereby it is possible to drive the vehicle even through deep snow. If the vehicle is fitted with a smooth plate affixed to the chassis, driving on swamps becomes possible by reducing the ground clearance to have a suitable small value. It is further possible to reduce the friction by blowing in air under the plate.

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In the advantageous embodiment of the invention it is arranged that the wheels can be raised so that

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they are higher than the level of the chassis underside. Such a vehicle is eminently suitable as a bog excavator because during excavating operations it can be lowered to rest on its chassis and its wheels will not be bogged down which could (owing to breaking up to the soil) impede the movement of the vehicle and would render the excavated ditch edges uneven.

A vehicle according to the invention also possesses an exceptionally useful feature namely that it is able to be manoeuvred sideways without making use of wheel traction. This feature is very useful for example when it is desired to move the vehicle in over a ditch in a longitudinal direction without need to drive a wheel over the ditch.

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Each pivotal arm may be rotatable about its pivotal axis by means of a hydraulic cylinder having a respective control valve. This is a simple and favourable design. The control valves are conveniently located in the driver's cab and are therefore easy to manipulate.

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In a further embodiment of the invention the ground wheels each consist of a bogie wheel set. Hereby a larger ground supporting area is obtained and travelling will be more secure on bogs for instance.

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Each bogie wheel set is advantageously pivotally mounted on a said pivotal arm at the centre of one of its two wheel members so that it can be rotated in a vertical plane under the actuation of a hydraulic cylinder. It is hereby possible to regulate the position of the bogie wheel set as desired and also to retain it in a given position for the traction wheel members.

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The actuating cylinder of the pivotal arm and that of the bogie wheel set may be connected together in parallel. By such a coupling, there will always be the same pressure in both cylinders even if the relative positions of the wheel members should vary owing to uneven ground. The consequence is that one obtains, independently of the position of the wheel members, the desired uniform surface pressure between the bogie wheel set and the ground. When the bogie wheel set is raised it will not be left hanging in an indefinite position.

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The invention will now be further described by way of example with reference to the accompanying drawing, in which:

*Figure 1* shows, schematically, a vehicle according to the invention viewed from above.

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*Figure 2* shows the vehicle on a laterally inclined plane.

*Figure 3* shows the vehicle on a longitudinally inclined plane,

*Figure 4* shows the hydraulic circuit for actuating the pivotal arms of the vehicle.

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*Figure 5* illustrates in five stages (a) to (e) the sidewise movement of the vehicle as it is manoeuvred to straddle a ditch.

*Figure 6* shows in elevation a vehicle according to the invention fitted with bogie wheel sets and *Figure 7* shows the hydraulic arrangement for actuating the pivotal arm of one of the bogie wheel sets.

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The chassis of the vehicle consists of two sections 1 and 2 which are swivellable relatively to each

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other, about a vertical axis 3 under the actuation of hydraulic cylinders 4 and 5. The ground wheels 6 of the vehicle are mounted on the free ends of arms 7 pivotally connected to the chassis 1, 2. The pivotal arms 7 are independently rotatable in vertical planes under the actuation of hydraulic cylinders 8, so that the positions in height of each of the wheels 6 can be changed independently of the others. As can be appreciated from Figure 4, the hydraulic cylinders 8 are supplied from a pressurised hydraulic fluid source through respective control valves 9.

In Figures 6 and 7, is shown a vehicle whose ground wheels each comprise a bogie wheel set 10 having two wheel members. Each bogie wheel set 10 is mounted at the free end of a pivotal arm 7, the arm 7 being pivotally connected to the centre 11 of one of the two wheel members. The pivoting movements of the bogie wheel set 10 relatively to the pivotal arm 7 in a vertical plane are controllable by hydraulic cylinder 12. The hydraulic cylinder 8 of the pivotal arm 7 and the hydraulic cylinder 12 of the bogie wheel set 10 are connected in parallel to the control valve 9.

The vehicle of Figures 6 and 7 may be used as a bulldozer, in which case the levelling blade may be attached to the chassis and the control motions, such as lifting, lowering and tilting motions, are accomplished by means of the cylinders 8.

Figure 5 illustrates the manner in which the vehicle of the invention, when in use as a ditch excavator for instance, is manoeuvred to straddle a ditch, without driving over the ditch. In Figure 5a, the vehicle has been positioned on one side of the ditch, and the ground clearance has been reduced to be about 10 cm. In Figure 5b, the vehicle has been turned into the position shown, by swivelling the chassis sections 1 and 2 relatively to each other and the wheels of one end have been raised aloft. The vehicle is now resting on its chassis and on the wheels at the other end. In Figure 5c, the wheels which are aloft have been turned so that the ditch is straddled by these wheels whereupon they are lowered to the ground. In Figure 5d, the other pair of wheels has been turned to be over the ditch, similarly to the first mentioned wheels as shown in Figure 5c. In Figure 5e, the vehicle has been straightened out to straddle the ditch. It is also possible, at ditch crossings and acute bends, to move the vehicle without letting the wheels run in the ditch.

## CLAIMS

1. A cross-country vehicle having a chassis consisting of two sections which are swivellable relatively to each other about a vertical axis and ground wheels located at the free end of pivotal arms connected to the chassis, said arms being rotatable about their pivotal axes in vertical planes under the actuation of pressure cylinders so that the position in height of the wheels can be changed, characterized in that each chassis section has connected to it two pivotal arms, all the pivotal arms being independently rotatable about their pivotal axes.

2. A cross-country vehicle according to claim 1, characterized in that said pivotal arms can be rotated

about their pivotal axes to a position such that the wheels of the vehicle are above the plane of the underside of the chassis.

3. A cross-country vehicle according to claim 1 or 2, characterized in that each pivotal arm is rotatable about its pivotal axis by means of a hydraulic cylinder having a respective control valve.

4. A cross-country vehicle according to any one of the preceding claims, characterized in that each ground wheel consists of a bogie-wheel set.

5. A cross-country vehicle according to claim 4, characterized in that each bogie wheel set is pivotally mounted on a said pivotal arm at the centre of one of its wheel members so that it is rotatable in a vertical plane relatively to said pivotal arm under the actuation of a hydraulic cylinder, the pressure cylinder in the form of a hydraulic cylinder for actuating said pivotal arm and the hydraulic cylinder for actuating said bogie wheel set being connected together in parallel.

6. A cross-country vehicle substantially as hereinbefore described with reference to the accompanying drawings.

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